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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/058,925	01/30/2002	Norihiro Inagaki	218790US0DIV	7761

22850 7590 05/15/2003

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EXAMINER

TSOY, ELENA

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 05/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/058,925

Applicant(s)

INAGAKI ET AL.

Examiner

Elena Tsoy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Specification

1. The disclosure is objected to because of the following informalities:
Page 4, line 6, page 5, line 3, page 6, line 7, page 11, line 27, page 12, line 18, page 13, line 5, page 23, line 18, page 24, line 16, "an SiO_x thin film" should be changed to -- "a SiO_x thin film".

Claim Objections

2. Claims 4, 13 are objected to because of the following informalities:
Claim 4, line 3, "comprising the steps of;" should be changed to -- comprising the steps of: --.
Claim 13, line 3, "a molar ratio of;" should be changed to -- a molar ratio of: --.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 4, 6, 7, 12, 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto et al (US 5,763,028) in view of Felts et al (US 5364,665), Ogawa et al (US 5,695,836) and Saiki (US 4,001,870).

Matsumoto et al disclose a method of manufacturing a gas barrier film (See column 1, line 16) having plastic layer 3 of polypropylene (PP) (See column 4, lines 19-20, 27-28, 63, 65), a thin inorganic oxide layer 2, for example, a silicon oxide layer having thickness of 50-1600 Angstroms (See column 5, lines 29-32) on the plastic layer 3 (See Fig. 1; column 4, lines 35-40,

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60-67). For forming a silicon oxide layer 2, pre-treatment of the surface of the plastic layer 3 is not particularly needed. However, in some cases, the surface can be activated by e.g., a discharge treatment and the like, or the surface can be treated with a chemical agent having an active residual group such as a silane coupling agent and the like. See column 5, lines 12-18. The silicon oxide layer can be formed by depositing or sputtering silicon or silicon oxides such as silicon monoxide or silicon dioxide in a vacuum or in an inactive gas, or by reactive deposition or reactive sputtering of silicon and/or silicon oxides excluding the use of silicon dioxide alone (See column 5, lines 19-23).

Matsumoto et al fail to teach that: (i) the silicone oxide (SiOx) thin layer is formed by plasma polymerization from organic silane such as alkoxyalkyl silane of claimed formula and oxygen (Claims 4, 12) in a ratio 3:7 -5:5 (Claim 13); (ii) PP film surface is activated with both discharge-like treatment such as plasma discharge and a silane coupling agent (Claim 4); the film surface after the plasma treatment is exposed to air atmosphere to introduce oxygen functional groups into the surface in the form of C-O (Claims 4, 6); the oxygen functional groups react with the silane coupling agent forming (tuning) molecular chains having -O-Si-O- structure (Claim 4).

As to (i), Felts et al teach that silicone oxide having excellent vapor and gas barrier properties for flexible packaging can deposited from silane such as ethyltrimethylsilane (which can be represented by general formula as claimed) (See column 4, lines 66-67) and oxygen in a ratio 0.1:1.0 (See column 5, lines 13-15) using plasma (See column 3, lines 35-47; column 4, lines 22-26, 62-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have deposited a silicon oxide layer in a method of Matsumoto et al from organic silane such as ethyltrimethylsilane and oxygen in a ratio 0.1:1.0 using plasma with the expectation of providing the desired excellent vapor and gas barrier properties, as taught by Felts et al.

As to (ii), Saiki et al teach that a silicon oxide layer can be securely attached to a polymer material having poor adhesive property (See column 2, lines 13-18) such as polyimide resin layer by using a silane coupling agent such as aminosilane coupling agent so that the silane coupling agent is chemically bonded to the resin layer (See column 4, lines 17-50). Saiki et al show that a silicon dioxide layer contains on its surface Si-OH groups which form -O- bond with the silane coupling agent (See column 4, lines 30-40).

Ogawa et al teach that contrary to polyamide and polyurethane resins having reactive imino groups (See column 7, lines 1-9), the surface of an inert substrate such as PP surface (See column 8, lines 30-31) should be treated with plasma, e.g. oxygen plasma (See column 10, lines 63-65; column 11, lines 56-58), to introduce reactive functionalities, such as OH-groups, in order to chemically bond a silane coupling agent to the inert surface (See column 7, lines 1-9) forming a structure such as that shown in Fig. 11 if a chlorosilane coupling agent is used (See column 15, lines 1-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have treated PP surface in method of Matsumoto et al with plasma discharge to introduce reactive functionalities, such as OH-groups onto the PP surface, followed by treating

with a silane coupling agent with the expectation of providing the desired secure chemical bonding of a silicon oxide layer to the plastic surface, as taught by Saiki et al and Ogawa et al.

As to the -O-Si-O- structure, since Saiki et al show that a silicon dioxide layer contains on its surface Si-OH groups (See column 4, lines 30-40) and a chemically attached silane coupling agent of Ogawa et al forms on the PP surface a plurality hydroxy groups (See Fig. 11; column 15, lines 20-37), the attached silicon oxide layer in Matsumoto et al in view of Saiki et al and Ogawa et al forms -O-Si-O- structure through chemical reaction of the plurality of hydroxy groups of the silane coupling agent with hydroxyl groups of a silicon oxide layer.

As to claim 7, Matsumoto et al in view of Saiki et al and Ogawa fail to teach that the introduction ratio of hydroxyl groups to the PP surface is in the range of 0.05-0.20.

However, the Examiner has established prima facie case of obviousness for treating PP surface. Therefore, the amount of introduced ratio of hydroxy groups claimed by the Applicants would fall within generic teaching of plasma treating. Applicants' allegations that the claimed range is critical are not supported by any evidence. Therefore, the prima facie case of obviousness has not been rebutted. If Applicants provide evidence that the claimed ratio is unexpected, the Examiner will allow the claim.

5. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto et al (US 5,763,028) in view of Felts et al (US 5364,665), Ogawa et al (US 5,695,836) and Saiki et al (US 4,001,870), as applied above, and further in view of Cahalan et al (US 5,229,172).

Matsumoto et al in view of Felts et al, Ogawa et al and Saiki et al, as applied above, fail to teach that the plasma treatment is performed using argon plasma.

Cahalan et al teach that a polymeric surface such as PP surface (See column 5, lines 10, 14-15) can be provided with oxygen containing groups including C-O form (e.g. hydroxyl groups) (See column 6, lines 46-51) either by using oxygen containing plasma or inert argon plasma since sufficient oxygen remains in the vacuum chamber (See column 5, lines 62-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used argon plasma for treating PP surface in a method of Matsumoto et al in view of Felts et al, Ogawa et al and Saiki et al with the expectation of providing the desired content of hydroxyl groups on the surface, since Cahalan et al teach that a polymeric surface such as PP surface can be provided with oxygen containing groups including C-O form (e.g. hydroxyl groups) either by using oxygen containing plasma or inert argon plasma since sufficient oxygen remains in the vacuum chamber.

6. **Claims 8-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto et al (US 5,763,028) in view of Felts et al (US 5,364,665), Ogawa et al (US 5,695,836) and Saiki et al (US 4,001,870), as applied above, and further in view of Komoto et al (US 6,376,559).

Matsumoto et al in view of Felts et al, Ogawa et al and Saiki et al fail to teach that the silane coupling agent is represented by claimed formula $-(R^1O)_n-Si-R^2_{(4-n)}$ wherein n is 1-4 (Claim 8); the reaction between the hydroxyl groups introduced onto PP surface and the silane coupling agent is performed by immersing the PP film in an alcohol solution of the silane coupling agent, and then heating the PP film coated with the alcohol solution (Claim 9) at 50-80°C (Claim 11); the concentration of the silane coupling agent in the alcohol solution is in the range of 0.1-10 % by weight (Claim 10).

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Komoto et al teach that a silane coupling agent such as methyltrimethoxysilane, methyltriethoxysilane, dimethyldimethoxysilane (which can be represented by general formula as claimed) (See column 9, lines 33-49) may be used for chemically bonding silica sol (See column 9, line 7) to an organic resin by introducing functional groups onto the surface of the silica sol, then the introduced groups react with the resin thereby chemically bonding silica sol to the resin through the silane coupling agent (See column 9, lines 17-33). The reaction of functional groups on silica sol surface with alkylalkoxysilane coupling agent may be carried out in alcohol (See column 41, lines 63-65) and at a temperature 20-100°C (See column 10, lines 51-58) with the amount of alkylalkoxysilane coupling agent being 1-40 wt % (See column 9, lines 49-51). Saiki et al, as was discussed above, show that a silicon dioxide contains on its surface Si-OH groups (See column 4, lines 30-40). In other words, reaction of alkoxy groups of the alkylalkoxysilane coupling agent with hydroxy groups on the surface may be carried out in alcohol at a temperature 20-100°C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used alkylalkoxysilane coupling agent such as methyltrimethoxysilane, methyltriethoxysilane, dimethyldimethoxysilane (which can be represented by general formula as claimed) in an amount of 1-40 wt % instead of chlorosilane coupling agent in a method of Matsumoto et al in view of Felts et al, Ogawa et al and Saiki et al for treating any surface having hydroxyl groups including a plasma treated PP surface and silica oxide surface in an alcohol at temperature 20-100°C with the expectation of providing the desired chemical bonding of the alkylalkoxysilane coupling agent to the hydroxyl groups, as taught by Komoto et al.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy whose telephone number is (703) 605-1171. The examiner can normally be reached on 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Elena Tsoy

Elena Tsoy
Examiner
Art Unit 1762

April 8, 2003